

4-10 Pumping Plants

Pumping plants involved in Special Funded Projects require essentially the same procedural steps and documents as for any other Special Funded structure on State right of way. The purpose of this section is to outline the differences in all project phases from project development through construction support.

General Pumping Plant Scoping and Design Considerations

Pumping plants have high initial cost, operational liability, maintenance expense, power cost, and are susceptible to untimely power outages and therefore should be used only when gravity flow systems are too costly or are otherwise not feasible.

Caltrans pumping plants are custom designed based on site specific criteria formed around Caltrans design philosophies for protecting the roadway from storm water flooding. In addition to site specific criteria, pumping plant designs are based on standard engineering principals for industry water conveying facilities. As such, there are no Caltrans design manuals available that specifically address pumping plant design.

Some general but significant Caltrans pumping plant design philosophies include the following:

- Storage is designed to store significant runoff before pumps switch on. This makes the storage need significantly larger than for usual industry pumping plants.
- Pump sizes are limited so that standardized trailer mounted generators, owned by Caltrans, can power them. Compared to industry pumps, pump sizes are smaller and cycle on less frequently.
- Pumps and outflow pipes are orientated to allow ease of inspection and maintenance.
- Pumping plants are dedicated specifically to the roadway drainage area contained within State right of way.
- Storm water runoff originating from outside Caltrans right of way must not enter the pumping plant drainage area.
- Groundwater pumping requirements must be handled by a separate system.

The design philosophies add cost as compared to typical industrial pumping plants (e.g. utility companies) but are essential to meet Caltrans operational requirements. Consultants must be aware of the philosophies in the early stages of projects when pumping plants are scoped and later when designed. As projects are developed, the design philosophies and site-specific design criteria are discussed in detail with consultants at the pre-Type Selection Meeting discussed later in this section.

Caltrans pumping plants must be designed to meet the pumping plant philosophies; the California Building Code; the regulations and codes listed in Section 7-1.02, “Regulations and Codes” of the Standard Specifications; and the industry standards that are applicable.

Project Development

The project development steps, processes and documents required for pumping plants are the same as for other structures on Caltrans right of way as described in sections elsewhere in this Guide. The basic project development steps and the nuances to each step as they pertain to pumping plants are described below.

Advance Planning Studies (APSs)

For new pumping plants, the APS must show the anticipated layout, estimated cost and other information customarily shown on APSs. In addition, the APS must note the approximate area to be drained, the assumed rainfall intensity, the estimated storage capacity, and an estimate of the pump horsepower required.

The consultant may base the costs of new pumping plants on the amount of runoff that will be pumped or by other means that will produce a viable estimate.

For pumping plant modifications, the same information must be shown as appropriate and estimates must be based primarily on the particular items of work involved.

Type Selection

The Type Selection process requires significant preparatory work and analysis beyond that required for usual bridge structures. Consultants and sponsoring agencies must factor this lead-time into their project schedules. A lead time of no less than one month should be assumed.

The Type Selection Process for pumping plants consists of the following steps:

- The preparation of a pumping plant data submittal (PPDS)
- District approval of the PPDS
- Pre-Type Selection Meeting
- Preparation of the General Plan
- Type Selection Meeting

The pumping plant data submittal (PPDS) must contain the preliminary information that Districts normally furnish DES for pumping plants designed by Caltrans. The



information required is published in the *Highway Design Manual* and in Chapter 3 of the *Drafting and Plans Manual of Instructions*.

The PPDS must be prepared by the consultant and approved by the District as a first step in the Type Selection process and before submitting it to the Liaison Engineer.

Once the PPDS is submitted to the Liaison Engineer and is reviewed, the consultant must attend a pre-Type Selection meeting at which the Caltrans pumping plant design philosophy will be discussed in detail and site-specific parameters for the design will be established. The meeting will be held in Sacramento.

Based on the requirements discussed at the meeting, the consultant must prepare a General Plan that will be used for Type Selection. As a step in determining the structure layout and layout of pump equipment on the General Plan, the consultant must perform the necessary iterative head calculations to determine the storage box volume and the number and horsepower of the pumps.

Other documents the consultant must prepare and submit for the pumping plant Type Selection meeting are the same as for other structures discussed in sections elsewhere in this Guide.

Pumping plant Type Selection Meetings are typically held separate from the other structures on a project because of the preliminary work required and the fact that pumping plant Type Selection issues generate significant and detailed discussion.

Unchecked Details and PS&E Submittals

The unchecked details and PS&E submittals should coincide with the same submittals for the other structures on the project whether or not the pumping plant Type Selection meeting was held separately.

Review durations for the pumping plant submittals may extend up to two weeks beyond the durations for other structures. The Liaison Engineer should be contacted to determine the durations to be anticipated.

Project Development Deliverables

Other than for the PPDS discussed under “Type Selection” above, the types of documents, their content, and formatting is the same as for other structures. This includes plans, special provisions, foundation reports, design calculations, independent check calculations, quantity calculations, etc. Significant differences are outlined below.

Plan Sheets

Pumping plant plans must consist of the following sheets assembled in the order shown:

- General Plan
- Structural drawings
- Mechanical drawings
- Electrical drawings

Plan sheet numbers in the lower right corner of the drawings are preceded by “GP”, “ST”, “M”, and “EE” respectively. Numbering restarts with each type of drawing.

Special Provisions

Standard Special Provisions (SSPs) for the structural work are available from the internet for consultants to download and use. For mechanical and electrical work, SSPs are not available from the internet and must be requested from the Liaison Engineer.

Sections in the Special Provisions must include the following:

Section 10:

- Contractual requirements in “Order of Work” that specify how the contractor must maintain pumping capacity within the drainage area during construction.
- Special provisions throughout for the structural work.

Section 11:

- Boilerplate provisions for “Pumping Plant Equipment”.
- Special provisions for “Pumping Plant Equipment”.
- Special provisions for “Pumping Plant Electrical”.

Construction Support

Construction support of pumping plants involves the same duties as for other structures where the consultant must perform the following:

- Answer questions and address issues that arise as the pumping plant is constructed
- Prepare change order revisions
- Review shop drawings and submittals*
- Make on-site visits when necessary*
- Prepare and submit as-built drawings

Of the above, the two items marked with an asterisk require further elaboration.

Review Shop Drawings and Submittals

Review of shop drawings and submittals requires more intensive effort than for usual bridge designs because of the number of submittals that are required.

The construction contractor must submit schedules of components to be installed in pumping plants to the DES Documents Unit. The schedules must be submitted to the Documents units regardless of whether the project is advertised by Caltrans or by others. The consultant must ensure the contract documents require this. The Documents Unit distributes the submittals to the Liaison Engineer, other DES functional units, and the consultant for review.

Once DES reviews are complete, the comments and recommendations will be transmitted to the consultant. The consultant must notify the Liaison Engineer immediately should there be an issue with the comments or recommendations provided. Otherwise, the consultant must incorporate the comments and recommendations into their own comments.

The submittals must be reviewed by the Engineer of Record, and if the Engineer of Record is not available, by another registered employee of the firm.

After review, the consultant must stamp each item of the submittal with a review stamp and return the submittal to the Documents Unit by overnight mail or by carrier within 5 working days. The review stamp used by consultant must be similar to the one shown at the end of this section.

Visits to the Construction Site

When requested by the Liaison Engineer, the consultant must visit the construction site to address design issues that arise during construction.

When the construction contractor tests pumping plants, Structure Representatives and consultants must inform the Liaison Engineer of the upcoming tests.

The Liaison Engineer will arrange for Caltrans representatives from the appropriate disciplines to attend the testing and make the final inspections and the final determination as to whether the test results are acceptable and in accordance with the contract documents. The Liaison Engineer will ensure the consultant is informed of the test should the consultant wish to attend.

Sample Review Stamp for Submittals



As discussed previously in this section, the consultant must stamp the construction contractor's submittals after review. The stamp must be similar to the one as shown below.

Place the name of the consultant firm here.

REVIEWED FOR THE STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DIVISION OF STRUCTURE DESIGN

by ABC Consultant Co.

☐ APPROVED—NO EXCEPTION TAKEN

☐ APPROVED—AS NOTED—SUBJECT TO NOTATIONS INDICATED IN RED

☐ NOT APPROVED—RESUBMIT

BY: _____ DATE: _____